FIVE-YEAR REVIEW REPORT

MIDCO II, GARY, INDIANA

Prepared by:

The United States Environmental Protection Agency (EPA)
Region V, Superfund Division

I. INTRODUCTION

This report presents the results of a Five-Year Review for the Midco II site located at 5900 Industrial Highway in Gary, Indiana. The purpose of this review is to evaluate whether the remedial action at Midco II remains protective of public health and the environment, is functioning as designed, and is being operated and maintained properly. This review was conducted pursuant to Section 121(c) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and Section 300.430(f)(4)(ii) of the National Contingency Plan, which require periodic review (at least once every five years) for sites where hazardous substances, pollutants or contaminants will remain above levels that would allow unlimited use and unrestricted exposure after completion of the remedial action.

The remedial action that EPA selected for the Midco II site will result in hazardous substances remaining in soils above concentrations that would allow unlimited use and unrestricted exposure. Therefore, a Five-Year Review is required for Midco II. Since remedial actions are ongoing at Midco II, a Type 1A review has been conducted in accordance with OSWER Directive 9355.7-02A, July 26, 1994. A Type 1A review is designed for sites with ongoing actions and do not include tasks that are duplicative or unnecessary because of the level of review and oversight that EPA normally conducts for ongoing remedial actions. Examples of tasks that are not included in Type 1A review are site visits specifically for the Five-Year Review and standards review. More thorough evaluations possibly including updated risk calculations and sampling can be conducted if the initial evaluation indicates that it is necessary. This report will be placed in the site files located at EPA's office at 77 W. Jackson Boulevard, Chicago, Illinois, and in the local repository for Midco II at the City of Gary Public Library.

II. SITE HISTORY AND CHARACTERISTICS

The Midco II operations were primarily conducted on an approximately seven acre area at 5900 Industrial Highway, Gary, Indiana in 1976 and 1977. After a major fire at Midco I in December 1996, the operator of the Midco I relocated his operations to Midco II. By the summer of 1977, thousands of drums and a number of tanks of chemical wastes were present on Midco II. Operations included neutralization of acids and caustics, on-site disposal via dumping into a "filter bed" and a sludge pit, both of which allowed liquid wastes to percolate into the ground, and storage and disposal of drums and tanks of chemical wastes. Wastes were dumped and spilled onto and into the ground. Much of the waste handled was from the paint industry. In August 1977, a large fire destroyed thousands of drums containing chemical wastes at Midco II and resulted in more spillage.

EPA installed a fence around Midco II 1981. In 1984-1985, EPA removed all surface wastes including thousands of drums and a number of tanks containing chemical wastes. Excavation and off-site disposal of highly contaminated soils and wastes in the sludge pit and filter bed began in 1985 and extended until 1989.

Under a 1985 Consent Decree, a Remedial Investigation/Feasibility Study (RI/FS) was completed between 1985 and 1989 at both Midco I and Midco II. The RI showed that the ground water at the site and portions of the subsurface soils were highly contaminated by volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and cyanide. However, the ground water movement is slow, and as a result the ground water contamination had not migrated far from the site.

Based on the results of the RI/FS, EPA selected a remedy for Midco II in Record of Decision (ROD) in 1989. A ROD was processed for Midco I at the same time. EPA repaired the fence around the site in 1991. The remedies for Midco I and Midco II were revised by ROD Amendments in 1992, and by an Explanation of Significant Differences in 1996. The State of Indiana concurred in all of the decision documents.

III. REMEDIAL ACTION REQUIREMENTS

The EPA approved remedy for Midco II includes the following components:

- Excavation and on-site S/S of contaminated sediments and underlying soils in a defined portion of the ditch along the north border of Midco II;

- Construction and operation of a ground water extraction system to cleanup contaminated ground water;

- Construction and operation of a deep underground injection well for disposal of the contaminated ground water, and treatment prior to deep well injection, if necessary;

- Treatment of highly contaminated soil by a combination of solidification/stabilization (S/S) and soil vapor extraction (SVE);

- Construction of a final cover, access restrictions, deed restrictions and monitoring.

The following table presents the cleanup and performance criteria applying to each of these actions:

ACTION/NAME OF CRITERIA	APPLICABILITY OF CRITERIA	QUANTIFICATION OF CRITERIA
Sediment and soil excavation/soil cleanup action levels (soil CALS)	After the initial excavation of the sediments, if the underlying soils exceeds the soil CALs, further excavation is required	Cumulative, lifetime, incremental cancer risk (CR) = 10^{-5} ; hazard index for non-carcinogenic effect (HI) = 1.0;[1] and lead = 500 mg/kg
Ground water extraction/ground water cleanup action levels (GWCALs)	Ground water capture zone must include all ground water exceeding the GWCALs, and extraction must continue until the ground water no longer exceeds the GWCALs	Primary MCLs (40 CFR 121); CR = 10^{-6}; HI = 1.0[2]; and Ambient Water Quality Criteria X 3.6
Deep well injection/ Maximum Allowable Concentrations (MACs)	The extracted ground water must not exceed the MACs prior to deep well injection	6.3 times the Health Based Levels used for RCRA delisting demonstrations in July 1991 (see attachment), except the MAC for 1,1-dichloroethane has been revised to 880 ug/l[3]
Soil treatment/ minimum areas for treatment	Soils within these defined areas must be treated by S/S and SVE	Areas outlined on a map in the Consent Decree
Soil Treatment/ soil treatment action levels (STALS)	Outside of defined minimum areas for treatment, if STALs are exceeded soil must be treated by S/S and/or SVE	CR = 5 X 10^{-4} ; HI = 1.0[1]; and lead = 1000 mg/kg.
SVE as a separate operation/SVE performance standards	Must be attained in soil following completion of SVE	97% reduction in total volatile organic compounds (VOCs)

[1] The CR and HI are calculated assuming hypothetical lifetime residential exposure to soils having the sampling point concentrations.

[2] The CR and HI are calculated assuming hypothetical lifetime exposure to residential water having the sampling point concentrations.

[3]By not exceeding the MACs the ground water meets the equivalent of RCRA delisting requirements and is considered non-hazardous pursuant to RCRA.

SVE using in-situ S/S apparatus/SVE performance standards	Must be attained in soil following soil mixing and air injection using the in-situ apparatus	90% reduction in the following VOCs: benzene, methylene chloride, trichloroethylene, tetrachloroethylene, 1,1,1-trichloroethane, 1,1-dichloroethylene, trans-1,2-dichloroethylene, and vinyl chloride
S/S/Minimum Performance Standards	Where S/S is required, must be met after completion of S/S	Metals≥90-99% reduction in mobility[4]; SVOCs ≥ 50% reduction[5]; hydraulic conductivity ≤ 10^{-7} cm/sec; unconfined compressive strength ≥ 50psi; wet-dry durability ≺ 10% weight loss; freeze-thaw durability ≺ 10% weight loss.
Air emissions/air emission Criteria	Air emissions must not have the potential to cause exceedance of these risk levels.[6]	CR = 1 X 10^{-7} ; HI = 1.0; and 3 pounds per hour of VOCs (as defined under Clean Air Act).
Fugitive dust/ fugitive dust action levels	If fugitive dust exceeds these concentrations, corrective measures must be taken to suppress the fugitive dust	Sediment excavation: 0.40 mg/m^{37} ; S/S: 0.07 mg/m^3; soil cover: 0.065 mg/$m^{3.}$
Final cover	Extent of final cover	Must cover the entire site

[4]The reduction in mobility is measured by comparing before and after treatment results of the Synthetic Precipitation Leaching procedure (SW-846, Method 1312).

[5] The reduction refers to a comparison of the concentration in methylene chloride extract from soil before treatment to the concentration after treatment. The reduction criteria applies to the following compounds: anthracene, bis(2-ethylhexyl)phthalate, ethyl benzene, fluoranthene, naphthalene phenanthrene, phenol, toluene and xylene.

[6] The risk applies to a hypothetical resident at the property boundary. The criteria applies separately to air emissions from the ground water treatment system, the S/S system, SVE, and excavation activities.

[7] These are the concentrations of fugitive dust that will provide protection to the a hypothetical resident at the property boundary to CR = 1 X 10^{-7} and a HI = 1.0, assuming soil concentrations equal the average of soil boring and test trench samples collected during the remedial investigation.

IV. STATUS OF REMEDIAL ACTIONS

EPA, the State of Indiana and Settling Defendants entered into an agreement on the final remedial actions for both Midco I and Midco II in a Consent Decree, which became effective in 1992. The Settling Defendants formed the Midco Remedial Corporation (MRC) to actually carry out the remedial actions. The MRC performed the remedial design for the ground water extraction, treatment and deep well injection system from 1993-1994. Ground water sampling was conducted during the spring of 1993 to determine the required extent of the capture zone and to evaluate treatment options. Based on this sampling, it was determined that it would be unnecessary to treat metals, but that treatment of certain organic compounds would be necessary to meet the MACs. The MRC proposed and EPA approved a treatment system consisting of filtration and organic treatment using an ultraviolet light/hydrogen peroxide (UV/HP) system. The approved design provided that, before continuous treatment and deep well injection could be initiated, one-day, three-day, and four-week tests must demonstrate that the system could consistently meet the MACs. The design also included monthly sampling of the effluent and hourly sampling for indicator parameters using an on-site gas chromatograph once continuous operation was initiated.

In 1993, the MRC partially completed the sediment excavation and consolidation of sediments onto the site for eventual treatment by S/S. The MRC left some of the sediments in place because they were much more voluminous and difficult to handle than expected. The MRC proposed an alternative approach to addressing the sediments, including extending the site fence, damming off the contaminated portion of the ditch, and rerouting flow in the ditch around the contaminated portion. These actions were implemented by the MRC in 1994. Contaminated sediments and underlying soils that were left in place are scheduled to be treated in-situ by S/S and contained under the site cover.

In 1993-1994 the MRC constructed the deep injection well. In 1994-95 the MRC constructed the ground water extraction. treatment and injection system.

In the spring of 1995, the MRC conducted a number of one-day tests on the system. After repeated testing using more and more severe treatment conditions, it was concluded that the UV/HP system could not meet the MAC for 1,1-dichloroethane of 2.5 ug/l. The MAC in the 1992 ROD Amendment for 1,1-dichloroethane was based on an estimate of its carcinogenic potency in a 1985 EPA report. EPA risk assessors carefully reviewed the most up to date information on the toxicity of 1,1-dichloroethane, and concluded that it was no longer justifiable to characterize 1,1-dichloroethane as a carcinogenic compound. They recommended that the MAC be revised to 880 ug/l. This change in the MAC for 1,1-dichloroethane was formalized in an Explanation of Significant Differences (ESD) issued on January 9, 1996.

Subsequent to issuance of the ESD, the MRC proceeded with the one-day, three-day and four-week tests. These tests demonstrated that the treatment system could consistently meet all of the MACs. Continuous operation of the ground water extraction, treatment and deep well injection

system was initiated in February 1996. An additional, one-day test was also run to evaluate the ability of the treatment system to meet the MACs under less severe treatment conditions. Following start-up, air emissions from the oil/water separator and equalization tank vent as well as ambient air were periodically sampled.

Under the Consent Decree, the MRC is required to initiate work on the soil treatment between February 1998 and February 1999 depending on monitoring results. The MRC has gone ahead with soil sampling related to the soil treatment. EPA has been conducting treatability studies to evaluate the effectiveness of S/S and to identify effective binders.

The Gary/Chicago Regional Airport is located across Industrial Highway from Midco II. Plans for expansion of this airport are under development, and these plans may involve use of the Midco II property. The Gary/Chicago Regional Airport Environmental Task Force has expressed concern regarding whether the remedial action at Midco II will be compatible with expansion of the Airport. EPA staff have been participating in discussions with the Task Force regarding this concern.

V. PROTECTIVENESS EVALUATION

ACCESS RESTRICTIONS AND DEED RESTRICTIONS

The soil and ground water treatment and containment objectives for completion of the remedial action have not yet been attained. However, in the interim the site remains protective of public health due to access restrictions and deed restrictions. Access to the site is restricted by a fence. In addition, personnel are present on the site to operate the ground water treatment system almost every day. These personnel will also be able to observe evidence of trespassing on the site and initiate corrective measures. In addition, EPA representatives periodically visit the site. Deed restrictions have been filed in the land records of Lake County, Indiana.

EPA's last on site inspection was on April 30, 1998. During this inspection, EPA identified the following concerns:

- The EPA inspector was told that the spent carbon and spent filters were going to be disposed under the site cover. This is inconsistent with Section II.G.3 of Appendix I of the Consent Decree, which states that any residuals from the ground water treatment process shall be considered a RCRA hazardous waste, and must be stored on-site and disposed of or treated on-site or off-site in accordance with RCRA regulations, including the Land Disposal Restrictions. This is also inconsistent with Section 19.6.5 of the IMP, which states that "spent activated carbon canisters ... will be collected by the respective supplier for disposal or regeneration of the carbon." EPA should be consulted prior to arranging this off-site disposal.

- The front gate to Midco II was left open throughout the inspection. Although personnel were present on the site, the MRC needs to assure that unauthorized persons do not enter through the gate.

The MRC has committed to evaluating options for disposal of the filter media and complying with the requirement to regenerate spent carbon. The MRC has responded that access through the Midco II entrance gate to the support area is needed for unscheduled deliveries, but that gates to the contaminated portions of the site and the drum storage area are kept locked to restrict access. In addition, the doors to the ground water treatment building are locked when an operator is not present. The MRC has posted the site telephone number on the gate.

SEDIMENT/SOIL EXCAVATION

In 1993, the MRC conducted partial excavation of the sediments in the areas defined in the Consent Decree. An EPA contractor oversaw this action. To conduct the excavation, earthen dams were constructed in the ditch to prevent sediment transport during the excavation. Visually contaminated sediments were found to extend much deeper and were more voluminous than had been anticipated. For this reason, because there was insufficient space within the minimum areas for soil treatment to store all of the sediments, and because ERM was not prepared to handle the volume of water that would be generated by further excavation (the sediments are below the water table), the MRC requested that the sediment excavation be discontinued within the "deep sediment area" (see Figure 2 from the Sediment Excavation Report dated December 17, 1993 by Environmental Resources Management-North Central, Inc. (ERM)). EPA approved discontinuation of the sediment excavation at that time, and required submission of a report evaluating options for handling the remaining sediments. The dams were left in place to contain the sediments while options for handling the sediments were further studied. When a film of light non-aqueous phase liquid was observed, booms were installed to prevent its migration.

Most of the sediments in the "deep sediment area" were left in-place. Outside of the "deep sediment area" 1-2 feet of sediments along with some underlying soils had been excavated. The excavated sediment/soils were placed on the Midco II site in the minimum areas for soil treatment. The sediments were mixed with ground corn cobs to absorb free water, and a temporary flexible membrane liner has been placed over the pile to prevent erosion. The condition of the flexible membrane liner is regularly inspected.

During the excavation, ambient air samples were collected for fugitive dust and VOCs. The CR = 10^{-7} , HI = 1.0, and fugitive dust action levels were never exceeded. However, during excavation within the "deep sediment area" the backhoe operator had to wear level B protection because the HNu readings exceeded 5 ppm.

Following the excavation, confirmatory samples were collected to evaluate attainment of the soil CALs. The sampling, analysis and data validation was conducted in accordance with an EPA approved Quality Assurance Project Plan. The sampling was overseen by an EPA contractor.

Soil samples D04, D05 and D06, which are outside of the deep sediment area (see Figure 2), met the soil CALs. However, U01, U02, U03, D02 and D03 exceeded the soil CALs. Among these samples CR was as high as 4×10^{-4} due to the following detections:

- Arsenic in all 6 smples with a calculated CR as high as 3.0×10^{-4} at a concentration of 68.7 mg/kg.

- Carcinogenic polyaromatic hydrocarbon in all 6 samples with a calculated cancer risk as high as 1×10^{-4} and total concentration as high as 21.7 mg/kg.

In addition, in U02 the detection of lead at 630 mg/kg exceeded the soil CAL for lead.

The few samples collected within the deep sediment area (A01, E01 and W01) exceeded not only the soil CALs but also the STALs, with CR was as high as 1×10^{-3} , arsenic as high as 146 mg/kg, and total carcinogenic polyaromatic hydrocarbons as high as 350 mg/kg.

The MRC submitted the Sediment Excavation Report to present information on the extent of sediment excavation conducted, to present the sampling information, and to evaluate options for sediment handling. Options evaluated included excavation with dewatering, excavation without dewatering, and treatment and containment of the sediments in-situ. The MRC recommended insitu treatment and containment of the sediment/soils exceeding the soil CALs. This option included the following components:

- Diversion of the ditch around the portion exceeding the soil CALs;

- Extension of the fence around the sediment areas remaining above the soil CALs;

- Treatment of the sediments in the deep sediment area by in-situ S/S;

- Following completion of the soil treatment, extension of the site cover over the entire deep sediment area and the portion of the ditch soils exceeding the soil CALs.

The alternatives that included excavation had a number of disadvantages including: they would require treatment and disposal of large volumes of water; they would require much more sediment treatment than was anticipated; they could spread the soil contaminations because the contaminated sediments would have to be stored on less contaminated portions of the site; it is uncertain whether the soil CALs can be attained through excavation; they would take longer to implement, and they may cause exceedance of the $CR = 10^{-7}$ air emission criteria.

EPA has provided preliminary approval of the in-situ treatment and containment option to address the sediments. The MRC completed diversion of the ditch and extension of the fence in 1994. The fence extension for this option is presented in the attached Figure 7 from the Sediment Excavation Report. Once the soil/sediment treatment by S/S is completed in the “deep

sediment area", and the site cover is extended over the areas exceeding the soil CALs, the major objectives of the Record of Decision will be satisfied. However, appropriate approvals will be required to allow capping of the sediment areas outside of the "deep sediment area" without first conducting S/S on soils exceeding the soil CALs.

In the interim period, diverting the ditch is preventing the contamination from migrating downstream, and the fence is reducing the risk of human contact. In spite of this, it is possible that there is an ongoing negative impact on wildlife that live or feed in the contaminated portion of the ditch due to exposure to contaminants. This exposure will be eliminated once the soil treatment and site cover portions of the remedy are implemented.

DEEP WELL INJECTION

Protection of underground sources of drinking water is assured by complying with the requirements of the EPA, Underground Injection Control program. The measures being implemented to comply with these requirements are summarized in the Midco Remedial Corporation. Midco I and Midco II Superfund Sites, Gary, Indiana, Underground Injection Control Permit Application, dated June 1993 (prepared by Golden Environmental Services, Inc.), as updated by the Five Year Underground Injection Well Reapplication Midco WDW-1, Midco Remedial Corporation, dated March 20, 1998 (prepared by ERM EnviroClean-North Central, Inc.). These documents have been reviewed and approved by EPA. Some of the requirements for deep well injection include:

- Injection must be below the B-cap into the lower Mount Simon formation, which is separated hydraulically from the lowermost USDW by the B-cap and the upper Mount Simon formation;
- Location of and correction of any improperly sealed, completed or abandoned wells that penetrate the injection zone within a two mile radius of the injection well;
- Casing and cementing requirements;
- Maximum pressure and flow rate requirements;
- Testing to assure that the injectate is not incompatible with the formation;
- Maintenance and operator requirements;
- Maintenance of a positive pressure on the annulus fluid that is at least 100 psi greater than the injection pressure throughout the length of the tubing;
- Continuous monitoring of injection pressure, flow rate, and annulus pressure;
- Annual and five-year mechanical integrity testing (with oversight by EPA);
- Monthly sampling for detailed analysis and hourly analysis for vinyl chloride on the treatment system effluent, to assure compliance with the MACs;
- Alarms and shut-off requirements;
- Submission of monthly reports to EPA.

The geologic location of the deep injection well does not meet the stringent requirements for deep injection of hazardous wastes (as defined by the Resource Conservation and Recovery Act). Therefore, the well is a Class I non-hazardous injection well, which can only inject non-

hazardous fluids. To assure that the ground water from Midco II is non-hazardous it is treated by filtration and UV/HP to meet the MACs. Initial compliance with the MACs was assured by completing a one-day, a three-day and a four-week test. During the one-day test, three samples (every 8 hours) of the treated ground water were collected for detailed analysis and the treated ground water collected in a tank so that further treatment could be provided if the MACs were not attained. Three samples (one each day) were collected during the three day test and four samples (one each week) during the four-week test. During the normal operation of the treatment system, a sample of the effluent is collected once a month and subjected to a detailed analysis. In addition, during operation of the treatment system, an on-site gas chromatograph analyzes the effluent for vinyl chloride each hour. If the gas chromatograph detects an exceedance of the MAC, it automatically shuts down the treatment system. An EPA contractor oversaw the one-day, three-day and four-week tests and periodically oversees the monthly sampling, while also inspecting operation of the system, the gas chromatograph and other items. The samples subjected to detailed analysis must be analyzed and validated in accordance with the EPA approved Quality Assurance Project Plan. An EPA contractor has periodically audited the data validation.

In spite of these safeguards, on the evening of May 19, 1996 through the morning of May 20, 1996, a combination of operator error and equipment failure resulted in approximately 17,000 gallons of contaminated ground water from the Midco II site passing through the system without UV/HP treatment. Before leaving for the day on May 19 the operator turned off the high-high alarm on the gas chromatograph. This alarm is designed to automatically shut-down the ground water extraction and treatment system before a MAC is exceeded. Later that evening a capacitor went out on the UV/HP unit, which automatically turned off the unit. This resulted in ground water exceeding the MACs flowing through the treatment system without UV/HP treatment. The volume of untreated ground water that flowed through the system was estimated to be 17,025 gallons. It is estimated that 16,715 gallons of this was stored in the internal piping, the 3-mile pipeline from Midco II to the deep well, the various storage tanks, and the deep well tubing, while a maximum of 310 gallons may have reached the uncased portion of the deep well. A sample collected from the equalization tank before the deep well confirmed that the untreated ground water exceeded the MAC for vinyl chloride. To address this situation later in May, ERM pumped all of the untreated ground water back to a storage tank on Midco II, backflushed the system with clean water, and then to pumped the untreated ground water and backflush water back through the Midco II treatment system. EPA approved this approach. To prevent passing untreated water through the treatment system in the future, ERM retrained the operators emphasizing that the high-high alarm on the gas chromatograph should never be left turned off. ERM also investigated adding an automatic shut-down of the system when the UV/HP unit goes down, but this has proven to be impractical.

GROUND WATER CAPTURE ZONE

The MRC has conducted repeated evaluations of the extent of the capture zone for the Midco II ground water extraction system. The latest evaluation is summarized in a report entitled Capture Zone Evaluation Report, Midco II Site, dated July 17, 1997 by ERM. Although the procedures used for this evaluation have not been fully satisfactory to EPA or IDEM, this evaluation has demonstrated that the target capture zone is usually not being achieved, but that the most contaminated ground water is being contained.

EPA's investigation into why the target capture zone was not being acheived, identified that the ground water extraction rate had consistently been less than the design rate. Based on modeling, the Pre-Design Report had predicted that a constant extraction rate of 24.5 gpm would be needed to attain the target capture zone. Inspection of the Monthly Progress Reports submitted by ERM indicated that from January 1 through July 31, 1997, the average extraction rate was only 14.5 gpm. The average extraction rate improved somewhat to 17.5 gpm between August 1 and December 31, 1997, but the extraction rate was still well below the design extraction rate. The low extraction rates are due both to an inability to consistently reach the design extraction rate and to an abundance of down-times. To address this deficiency, in a letter dated February 24, 1998, EPA required that the MRC submit a Corrective Action Report, consisting of a plan to increase the operating flow rate and to reduce down-times.

In response, ERM has submitted the Ground Water Extraction and Treatment System Corrective Action Report (CAR) to identify potential causes of the low average extraction rates and propose additional evaluation. Later ERM submitted the Ground Water Extraction and Treatment Systems Corrective Action Recommendations Report (CARR) to present the results of the evaluation and make final recommendations. The CAR identified a number of reasons for the reduced average flow rates, including: high maintenance requirements on the extraction well pumps, rapid pressure build-up on pretreatment filters due to solids and oil in the aquifer, rapid fouling of the UV lamps which requires frequent cleaning cycles (during which the water is partially treated and recycled to the front of the UV/HP unit), and delayed response to shut-downs occuring when the system is not manned.

The MRC has alreading implemented a number of actions to increase the extraction rates including:

- cleaning, upgrading and replacing some extraction well pumps and piping;
- rehabilitating one extraction well;
- cleaning out the oil/water separator;
- increasing the time period between cleaning cycles for the UV lamps on the HP/UV treatment system;
- adjusting the schedule for replacement of prefilters and post-filters;
- correcting communication problems between Midco I and Midco II;
- other additional inspection and maintenance.

The CARR was submitted on August 31, 1998 and is still under review by EPA and IDEM. The CARR recommends the following additional actions to increase average extraction rates, subject to EPA approval:

- improvement of the extraction well maintenance and rehabilitation procedures;
- additional improvements to the extraction well pumps;
- replacement of the existing pumps in the Midco II prefiltration and postfiltration systems with pumps having a higher discharge pressure.
- discharging the UV tube cleaning water instead of recycling it; and
- arranging for an on-call operator to respond quickly to operational problems occurring when the system is unmanned.

Other improvements, including operating the HP/UV system at a higher flow rate are still under review.

Since April 1998, the average monthly ground water extraction rates have increased to 22.5 gpm in May, and 23.5 gpm in June, 20.5 gpm in July, and 25.4 gpm in August. When it is determined that the ground water extraction and treatment system can consistently acheive the design flow rate, the capture zone evaluation will be repeated. An EPA contractor has overseen the field work for the capture zone evaluatiion. ERM has proposed repeating the capture zone evaluation starting in April 1999. EPA and IDEM will be working with MRC to improve the capture zone evaluation methodology.

Although consistent capture of ground water at peripheral monitoring wells has not been maintained, the capture zone evaluation does indicate that, except after heavy precipitation events, hydraulic capture of the most contaminated VOC contaminated ground water is being maintained. For this reason, because there are no ground water users in the immediate vicinity of the site, and because the ground water movement is very sluggish, the failure to attain the target capture zone over the past two years has not caused a significant off-site risk. It is expected that the full capture zone will be attained once the ground water extraction system consistently meets the design extraction rate. The average extraction rate during August exceeded the design rate, and hopefully this will continue.

GROUND WATER CLEANUP

The results of the latest annual ground water monitoring event indicates that the ground water at the site is still highly contaminated (see the attached Tables 5-2 and 5-3 from the 1998 Annual Ground Water Monitoring, Midco I and Midco II Sites, August 1998 by ERM). Although there is insufficient information to draw conclusions regarding trends in the ground water parameters, Table 5-3 indicate that copper and a number of VOCs may be decreasing. Presently ERM is predicting that the GWCALs will be attained in about 10 years. An EPA contractor has been overseeing the annual ground water sampling. The ground water analysis and data validation is conducted in accordance with the EPA approved Quality Assurance Project Plan. An EPA contractor sometimes audits the data validation.

AIR EMISSIONS FROM GROUND WATER TREATMENT SYSTEM

The Consent Decree requires continuous monitoring of the off-gas from the ground water treatment system. At the time of the Consent Decree, EPA anticipated that the ground water treatment technology would be air stripping with vapor phase carbon adsorption. This type of treatment generates a high volume VOC contaminated air stream that would require control using carbon adsorption. However, the treatment technology being used is UV/HP, which destroys VOCs and generates no significant air emissions. As a result, the only source of VOC emissions from the Midco II ground water treatment system is the vent on the oil/water separator and on the equalization tank. Since the rate of air discharge from the oil/water separator and the equalization tank is very low compared to an air stripper, MRC requested that the continuous emission monitoring not be required. EPA agreed to this change pending evaluation of the monitoring data.

Ambient air and air emission samples were first collected during March, April, May and June 1996. ERM prepared a report on the results dated May 30, 1996. The rate of VOC discharge was determined to be well below the 3 pound per hour limit. Although the air discharge rate is low, the air emission samples from the vent had fairly high concentrations of a number of VOCs, including vinyl chloride from 4 to 1162 ppbv, benzene from 2 to 64 ppbv, trichloroethylene from less than 2 to 24 ppbv, and methylene chloride from less than 2 to 38 ppbv. Six air emission samples were collected, generally every two weeks. There was no obvious downward trend in the concentrations versus time. Some of these parameters were also detected in at least one downwind ambient air samples during at least one of the five sampling events as follows: vinyl chloride in one event at 2 ppbv; benzene in one event at 1 ppbv; and methylene chloride in three events at as high as 4 ppbv (although methylene chloride was also detected in the upwind sample at 4 ppbv during one sampling event). In response to this situation, the MRC proposed to install a vent fan and then to repeat the ambient air and air emission sampling. EPA agreed to this change since it would help assure that workers on and near the site would not be affected by the emissions.

The MRC installed forced air ventilation on the vent (150 cubic feet per minute), but the subsequent sampling indicated that the ventilation fan may be stripping VOCs from the ground water in the oil/water separator and the equalization tank. Therefore in June 1997, the MRC modified the system so that a vacuum was not created in the oil/water separator and equalization tanks. The MRC conducted four ambient air and air emission measurements during July through August 1997. The data for this sampling is presented in reports by ERM dated December 15, 1997 and April 21, 1998. Out of the four air emission sampling events, vinyl chloride was. detected in two events at 6 and 3 ppbv, and benzene, trichloroethylene and methylene chloride were not detected. This data was input into an air dispersion and risk assessment model. The results showed that the emissions met the CR = 10^{-7} and HI = 1.0 criteria. No vinyl chloride, benzene, trichloroethylene, or methylene chloride were detected in the downwind ambient air samples.

SOIL TREATMENT AND SITE COVER

The soil treatment and subsequent construction of the site cover over the entire site has not been initiated. As a result, high concentrations of contaminants remain in the soil and sediments on the site. The soil contamination is primarily in the subsurface soils and the contaminated sediments are contained between dams; so off-site migration due to wind and surface water erosion is not significant. As mentioned above the access restrictions and deed notifications provide protection of the public health and environment from the soil contamination during the interim period before the treatment and covering is completed. In addition, health and safety procedures that are being implemented at the site are preventing significant exposures to on-site workers.

VI. RECOMMENDATIONS

The Midco II site is being regularly inspected. Deficiencies in access restrictions are being routinely addressed. The sediment and underlying soil excavation has been partially completed, and the excavated sediment/soils are being temporarily stored in a safe manner on-site. Much of the sediments will remain in place, be treated by S/S and covered. Soils outside of the deep sediment area that exceed soil CALs have been enclosed in the site fence and will be covered with the site cover, subject to appropriate approvals. The diversion of the ditch around the contaminated sediments along with extension of the site fence around the contaminated sediments will provide sufficient protection to human health until the soil treatment and site cover actions are implemented.

All required safeguards required to prevent contamination of drinking water aquifers due to the deep well injection are being implemented. This has included extensive initial sampling to demonstrate that the treatment system can consistently meet the MACs. In addition, monthly sampling with detailed analysis and hourly analysis for vinyl chloride is being performed during continuous operation of the system. Although an event occurred that resulted in passing untreated ground water through the treatment system, the MRC was able to recover and retreat the contaminated ground water. The MRC has also revised its operator training to prevent a recurrence of such an event.

The target ground water capture zone is not being consistently attained. However, this is not causing a significant off-site human health or environmental risk at this time. The failure to consistently attain the capture zone is likely due to the extraction and treatment system not attaining the design flow rate. The MRC is now in the process of evaluating and correcting the flow rate problem.

The ground water extraction and treatment system is succeeding in meeting the objective of containing and removing the most contaminated ground water from the site, and providing sufficient treatment to meet the MACs prior to deep well injection. The system will have to operate for many years to meet the GWCALs.

The ambient air and air emission data demonstrates that the 3 pound per hour of VOCs, the CR = 10^{-7} and HI = 1.0 criteria are being met. This included consideration of the inhalation carcinogenic potency factor for vinyl chloride, even though this was not included in the Consent Decree and Record of Decision due to an oversight. In addition, the sediment excavation complied with the fugitive dust action levels. The fugitive dust action levels used the 41 (mg/kg x d)$^{-1}$ inhalation carcinogenic potency factor for hexavalent chromium even though this was mistakenly recorded as 4.1 (mg/kg x d)$^{-1}$ in the Consent Decree and Record of Decision due to an oversight. EPA plans to correct the inhalation carcinogenic potency factors for vinyl chloride and hexavalent chromium in the Consent Decree and Record of Decision in the near future.

VII. STATEMENT ON PROTECTIVENESS AND FUTURE REVIEWS

I certify that during the interim period (until the final soil treatment and site cover requirements are implemented, and until corrective measures are implemented to increase the ground water extraction flow rate and to achieve the target capture zone) the remedial actions taken at this site are providing protection to human health and the environment. Furthermore, the ground water extraction system is making progress in cleaning up the shallow ground water.

The next five-year review will be conducted by September 2003.

William E. Muno, Director Superfund Division
Region V, EPA

ATTACHMENTS:

- Health Based Levels and Solubilities For Constituents of Concern in Delisting Petitions, July 1991

- Figure 2 from the Sediment Excavation Report, Confirmatory Sample Locations, Midco II Site, Gary, Indiana

- Figure 7 from the Sediment Excavation Report, Extended Fence, Midco II Site, Gary, Indiana

- Tables 5-2 and 5-3 from the 1998 Annual Monitoring Report, Midco I and Midco II Sites, Gary, Indiana, Summary of the Comparison of Analytical Results with the Clean-Up Action Levels, and Summary of the Target Compound List/Target Analyte List Results and Comparison with Previously Collected Data, respectively

ATTACHMENT 3

HEALTH-BASED LEVELS AND SOLUBILITIES
FOR CONSTITUENTS OF CONCERN IN DELISTING PETITIONS
July 1991

CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
83 32 9	Acenaphthene	2	26	3.42	6
67 64 1	Acetone	4	4	1.0×10^{6}	6
75 05 8	Acetonitrile	2×10^{-1}	4	1.0×10^{6}	6
98 86 2	Acetophenone	4	4	5.5×10^{3}	15
107 02 8	Acrolein	5×10^{-1}	37	5×10^{5}	2
79 06 1	Acrylamide	Treatment Technique	42	$>1 \times 10^{6}$	15
107 13 1	Acrylonitrile	6×10^{-5}	5	7.9×10^{4}	6
309 00 2	Aldrin	2×10^{-6}	5	1.8×10^{-1}	6
62 53 3	Aniline (Benzeneamine)	6×10^{-3}	5	3.5×10^{4}	2
7440 36 0	Antimony	1×10^{-2}	27		
140 57 8	Aramite	1×10^{-3}	26		
7440 38 2	Arsenic	5×10^{-2}	13		
7440 39 3	Barium	1	13		
56 55 3	Benz(a)anthracene	1×10^{-5}	16	5.7×10^{-3}	6
71 43 2	Benzene	5×10^{-3}	14	1.75×10^{3}	6
92 87 5	Benzidine	2×10^{-7}	5	4.0×10^{2}	6
50 32 8	Benzo(a)pyrene	2×10^{-4}	27	1.2×10^{-3}	6
205 99 2	Benzo(b)fluoranthene	2×10^{-5}	8	1.4×10^{-2}	6
100 51 6	Benzyl alcohol	1×10^{1}	26	4×10^{4} (17°C)	15
100 44 7	Benzyl chloride	2×10^{-4}	5	3.3×10^{3}	6
7440 41 7	Beryllium	1×10^{-3}	27		
111 44 4	Bis(2-chloroethyl)ether	3×10^{-5}	5	1.02×10^{4}	6
108 60 1	Bis(2-chloroisopropyl ether)	1	4	1.7×10^{3}	6
117 81 7	Bis(2-ethylhexyl)phthalate	3×10^{-3}	5	4×10^{-1}	11
75 27 4	Bromodichloromethane	3×10^{-4}	5	4.7×10^{3} (22°C)	22
74 83 9	Bromomethane	5×10^{-3}	4	1.0×10^{3}	18
85 68 7	Butyl benzyl phthalate	7	4	2.9	10
88 85 7	2-sec-Butyl-4,6-dinitrophenol (Dinoseb)	7×10^{-3}	27	5×10^{1}	6
7440 43 9	Cadmium	5×10^{-3}	42		
75 15 0	Carbon disulfide	4	4	2.94×10^{3}	6
56 23 5	Carbon tetrachloride	5×10^{-3}	14	7.57×10^{2}	6
57 74 9	Chlordane	2×10^{-3}	42	5.6×10^{-1}	6
106 47 8	p-Chloroaniline	1×10^{-1}	4	3.9×10^{3}	24
108 90 7	Chlorobenzene	1×10^{-1}	42	4.66×10^{2}	6
510 15 6	Chlorobenzilate	7×10^{-1}	4	1×10^{4}	1
126 99 8	2-Chloro-1,3-butadiene (Chloroprene)	7×10^{-1}	26	3×10^{2}	1
124 48 1	Chlorodibromomethane	4×10^{-4}	5	4.4×10^{3}(22°C)	22
67 66 3	Chloroform	6×10^{-3}	5	8.2×10^{3}	6
95 57 8	2-Chlorophenol	2×10^{-1}	4	2.85×10^{4}(20°C)	15
107 05 1	3-Chloropropene (Allyl chloride)	2×10^{-3}	36	1×10^{2}	15

HEALTH-BASED LEVELS AND SOLUBILITIES
FOR CONSTITUENTS OF CONCERN IN DELISTING PETITIONS
July 1991

CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
7440 47 3	Chromium	$1x10^{-1}$	42		
218 01 9	Chrysene	$2x10^{-4}$	8	$1.8x10^{-3}$	6
319 77 3	Cresols	2	4	$3.1x10^{4}$	6
57 12 5	Cyanide	$2x10^{-1}$	27		
94 75 7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	$7x10^{-2}$	42	$8.9x10^{2}$	6
72 54 8	DDD	$1x10^{-4}$	5	$1x10^{-1}$	6
72 55 9	DDE	$1x10^{-4}$	5	$4x10^{-2}$	6
50 29 3	DDT	$1x10^{-4}$	5	$5x10^{-3}$	6
2303 16 4	Diallate	$6x10^{-4}$	26	$1.4x10^{1}$	6
53 70 3	Dibenz(a,h)anthracene	$7x10^{-7}$	8,17	$5.0x10^{-4}$	6
96 12 8	1,2-Dibromo-3-chloropropane	$2x10^{-4}$	42	$1.0x10^{3}$	6
74 95 3	Dibromomethane	$4x10^{-1}$	4	$1.3x10^{4}$	25
84 74 2	Di-n-butyl phthalate	4	4	$1.3x10^{1}$	6
95 50 1	1,2-Dichlorobenzene	$6x10^{-1}$	42	$1.0x10^{2}$	6
106 46 7	1,4-Dichlorobenzene	$7.5x10^{-2}$	14	$7.9x10^{1}$	6
91 94 1	3,3'-Dichlorobenzidine	$8x10^{-5}$	5	4	6
75 71 8	Dichlorodifluoromethane	7	4	$2.8x10^{2}$	6
75 34 3	1,1-Dichloroethane	$4x10^{-4}$	26	$5.5x10^{3}$	6
107 06 2	1,2-Dichloroethane	$5x10^{-3}$	14	$8.52x10^{3}$	6
75 35 4	1,1-Dichloroethylene	$7x10^{-3}$	14	$2.25x10^{3}$	6
156 59 2	cis-1,2-Dichloroethylene	$7x10^{-2}$	42	$3.5x10^{3}$	6
156 60 5	trans-1,2-Dichloroethylene	$1x10^{-1}$	42	$6.3x10^{3}$	6
75 09 2	Dichloromethane	$5x10^{-3}$	27	$2.0x10^{4}$	6
120 83 2	2,4-Dichlorophenol	$1x10^{-1}$	4	$4.6x10^{3}$	6
78 87 5	1,2-Dichloropropane	$5x10^{-3}$	42	$2.7x10^{3}$	6
542 75 6	1,3-Dichloropropene	$2x10^{-4}$	5	$2.8x10^{3}$	6
60 57 1	Dieldrin	$2x10^{-6}$	5	$1.95x10^{-1}$	6
84 66 2	Diethyl phthalate	$3x10^{1}$	4	$8.96x10^{2}$	6
56 53 1	Diethlystilbesterol	$7x10^{-8}$	26	$1.3x10^{4}$	15
60 51 5	Dimetoate	$7x10^{-3}$	4	$2.5x10^{4}$	6
119 90 4	3,3'-Dimethoxybenzidine	$3x10^{-3}$	26	$2x10^{3}$	1,23
119 93 7	3,3'-Dimethylbenzidine	$4x10^{-6}$	26	$7x10^{1}$	1,23
57 97 6	7,12-Dimethylbenz(a)-anthracene	$1x10^{-5}$	20	$4.4x10^{-3}$	6
105 67 9	2,4-Dimethylphenol	$7x10^{-1}$	4	$5.9x10^{2}$	9
131 11 3	Dimethyl phthalate	$4x10^{1}$	26	$4.3x10^{3}$	2
99 65 0	1,3-Dinitrobenzene	$4x10^{-3}$	4	$4.7x10^{2}$	6
51 28 5	2,4-Dinitrophenol	$7x10^{-2}$	4	$5.6x10^{3}$	6
121 14 2	Dinitrotoluene	$5x10^{-5}$	5,21	$1.32x10^{3}$	6
117 84 0	Di-n-octyl phthalate	$7x10^{-1}$	26	3	22
123 91 1	1,4-Dioxane	$3x10^{-3}$	5	$4.31x10^{5}$	6

HEALTH-BASED LEVELS AND SOLUBILITIES
FOR CONSTITUENTS OF CONCERN IN DELISTING PETITIONS
July 1991

CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
122 39 4	Diphenylamine	$9x10^{-1}$	4	$5.76x10^{1}$	6
122 66 7	1,2-Diphenylhydrazine	$4x10^{-5}$	5	$1.84x10^{3}$	6
298 04 4	Disulfoton	$1x10^{-1}$	4	$2.5x10^{1}$	24
115 29 7	Endosulfan	$2x10^{-3}$	4	$5.3x10^{-1}$	22
72 20 8	Endrin	$2x10^{-4}$	13	$2.5x10^{-1}$	22
106 89 8	Epichlorohydrin (1-Chloro-2,3-epoxypropane)	Treatment Technique	42	$6.0x10^{4}$	6
110 80 5	2-Ethoxy ethanol	$1x10^{1}$	26	$1x10^{5}$	1
100 41 4	Ethyl benzene	$7x10^{-1}$	42	$1.52x10^{2}$	6
60 29 7	Ethyl ether	$2x10^{1}$	4	$6.05x10^{4}$	12,2
106 93 4	Ethylene dibromide	$5x10^{-1}$	42	$4.3x10^{3}$	6
97 63 2	Ethyl methacrylate	3	26	$7x10^{2}$	1,6
62 50 0	Ethyl methanesulfonate	$1x10^{-6}$	28	$3.69x10^{5}$	6
52 85 7	Famphur	$1x10^{-3}$	41	$1.43x10^{2}$	15
206 44 0	Fluoranthene	1	4	$2.06x10^{-1}$	6
86 73 7	Fluorene	1	4	1.69	6
16984 48 8	Fluoride	4	39		
64 18 6	Formic acid	$7x10^{1}$	4	$1x10^{6}$	6
76 44 8	Heptachlor	$4x10^{-4}$	42	$1.8x10^{-1}$	6
1024 57 3	Heptachlor epoxide (alpha, beta, gamma isomers)	$2x10^{-4}$	42	$3.5x10^{-1}$	6
118 74 1	Hexachlorobenzene	$1x10^{-3}$	27	$6.0x10^{-3}$	6
87 68 3	Hexachlorobutadiene	$4x10^{-4}$	5	$1.5x10^{-1}$	6
77 47 4	Hexachlorocyclopentadiene	$5x10^{-2}$	27	2.1	6
67 72 1	Hexachloroethane	$3x10^{-3}$	5	$5.0x10^{1}$	6
70 30 4	Hexachlorophene	$1x10^{-2}$	4	$4x10^{-3}$	6
319 84 6	alpha-HCH	$6x10^{-6}$	26	1.63	6
319 85 7	beta-HCH	$2x10^{-5}$	26	$2.4x10^{-1}$	6
193 39 5	Indeno(1,2,3,cd)pyrene	$2x10^{-4}$	8	$5.3x10^{-4}$	6
78 83 1	Isobutanol	$1x10^{1}$	4	$7.6x10^{4}$	3
78 59 1	Isophorone	$9x10^{-3}$	5	$1.2x10^{4}$	15
143 50 0	Kepone	$2x10^{-6}$	29	7.6 (24°C)	15
7439 92 1	Lead	$1.5x10^{-2}$	44		
58 89 9	Lindane (gamma-HCH)	$2x10^{-4}$	42	7.8	6
7439 97 6	Mercury	$2x10^{-3}$	42		
126 98 7	Methacrylonitrile	$4x10^{-3}$	4	$2.5x10^{4}$	15
67 56 1	Methanol	$2x10^{1}$	4	$>1x10^{6}$	1
72 43 5	Methoxychlor	$4x10^{-2}$	42	$4x10^{-2}$(24°C)	24
74 87 3	Methyl chloride	$3x10^{-3}$	26	$6.5x10^{3}$	6
56 49 3	3-Methylcholanthrene	$4x10^{-6}$	30		
78 93 3	Methyl ethyl ketone	2	4	$2.68x10^{5}$	6
108 10 1	Methyl isobutyl ketone	2	4	$1.91x10^{4}$	2

HEALTH-BASED LEVELS AND SOLUBILITIES
FOR CONSTITUENTS OF CONCERN IN DELISTING PETITIONS
July 1991

CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
80 62 6	Methyl methacrylate	3	43,26	2.0×10^{1}	6
298 00 0	Methyl parathion	9×10^{-3}	4	6×10^{1}	6
91 20 3	Naphthalene	1×10^{-1}	26	3.4×10^{1}	15
91 59 8	2-Naphthylamine	4×10^{-5}	31	5.86×10^{2}	6
7440 02 0	Nickel	1×10^{-1}	27		
98 95 3	Nitrobenzene	2×10^{-2}	4	1.9×10^{3}	6
79 46 9	2-Nitropropane	4×10^{-6}	26	1.7×10^{5}	38
924 16 3	N-Nitroso-di-n-butylamine	$6X10^{-6}$	5	6.7×10^{3}	1,23
55 18 5	N-Nitrosodiethylamine	2×10^{-7}	5	4.1×10^{5}	1,23
62 75 9	N-Nitrosodimethylamine	7×10^{-7}	5	2×10^{2}	1
156 10 5	N-Nitrosodiphenylamine	7×10^{-3}	5	4.0×10^{1}	10
621 64 7	N-Nitrosodi-n-propylamine	5×10^{-6}	5	9.9×10^{3}	1
10595 95 6	N-Nitrosomethylethylamine	2×10^{-6}	26	2×10^{4}	1
100 75 4	N-Nitrosopiperidine	8×10^{-6}	32	$>1 \times 10^{6}$	6
930 55 2	Nitrosopyrrolidine	2×10^{-5}	5	$>1 \times 10^{6}$	6
152 16 9	Octamethyl pyrophosphoramide	7×10^{-2}	26	$>1 \times 10^{6}$	1
56 38 2	Parathion	2×10^{-1}	26	2.4×10^{1} (20°C)	15
608 93 5	Pentachlorobenzene	3×10^{-2}	4	1.35×10^{-1}	6
82 68 8	Pentachloronitrobenzene	1×10^{-1}	4	7.11×10^{-2}	6
87 86 5	Pentachlorophenol	1×10^{-3}	19	1.4×10^{1}	6
108 95 2	Phenol	2×10^{1}	4	9.3×10^{4}	6
298 02 2	Phorate	7×10^{-3}	40	5×10^{1}	18
1336 36 3	Polychlorinated biphenyls	5×10^{-4}	42	3.1×10^{-2}	6
23950 58 5	Pronamide	3	4	1×10^{2}	1
129 00 0	Pyrene	1	4	1.32×10^{-1}	6
110 86 1	Pyridine	4×10^{-2}	4	4×10^{4}	1
94 59 7	Safrole	1×10^{-4}	33	1.5×10^{3}	6
7782 49 2	Selenium	5×10^{-2}	42		
7440 22 4	Silver	5×10^{-2}	13		
57 24 9	Strychnine and salts	1×10^{-2}	4	1.56×10^{2}	6
100 42 5	Styrene	1×10^{-1}	42	3×10^{2}	15
95 94 3	1,2,4,5-Tetrachlorobenzene	1×10^{-2}	4	6	6
630 20 6	1,1,1,2-Tetrachloroethane	1×10^{-3}	26	2.9×10^{3}	6
79 34 5	1,1,2,2-Tetrachloroethane	2×10^{-4}	5	2.9×10^{3}	6
127 18 4	Tetrachloroethylene	5×10^{-3}	42	1.5×10^{2}	6
58 90 2	2,3,4,6-Tetrachlorophenol	1	4	1×10^{3}	6
3689 24 5	Tetraethyl dithiopyro-phosphate	2×10^{-2}	4	3×10^{1}	25
7440 28 0	Thallium	2×10^{-3}	27		
108 88 3	Toluene	1	42	5.35×10^{2}	6
95 80 7	Toluene-2,4-diamine	9×10^{-5}	34	4.77×10^{4}	6

HEALTH-BASED LEVELS AND SOLUBILITIES
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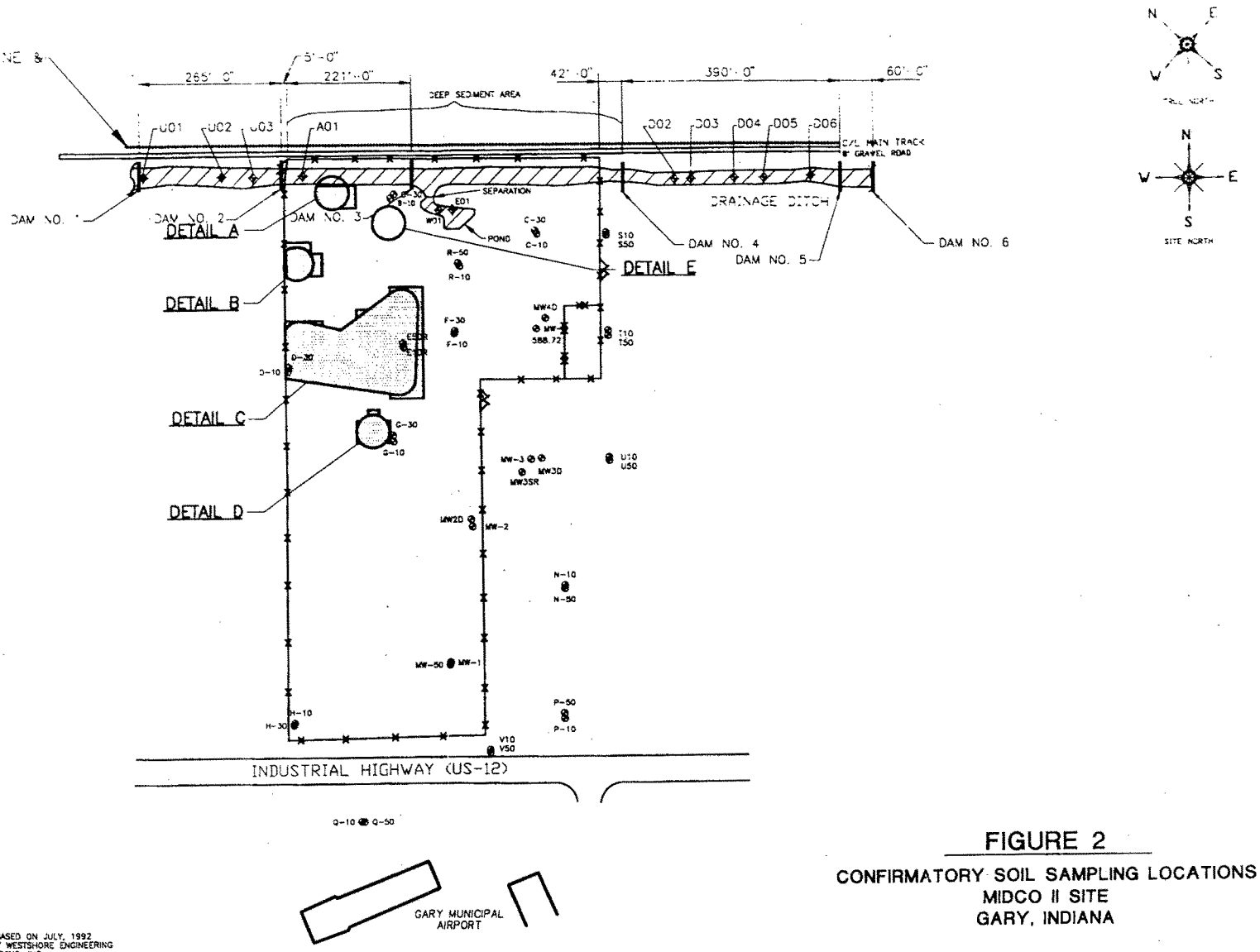
CAS No.	Compound	HBL (mg/l)	Ref.	Solubility (mg/l) (in H_2O at 25°C)	Ref.
823 40 5	Toluene-2,6-diamine	7	7	1.3×10^{5}	1
95 53 4	o-Toluidine	1×10^{-4}	26	7×10^{2}	1,23
106 49 0	p-Toluidine	2×10^{-4}	26	7.4×10^{3} (21°C)	15
8001 35 2	Toxaphene	3×10^{-3}	42	5×10^{-1}	6
93 72 1	2,4,5-TP (Silvex)	5×10^{-2}	42	1.4×10^{2}	2
75 25 2	Tribromomethane (Bromoform)	4×10^{-3}	5	3.01×10^{3}	6
120 82 1	1,2,4-Trichlorobenzene	9×10^{-3}	27	3.0×10^{1}	6
71 55 6	1,1,1-Trichloroethane	2×10^{-1}	14	1.5×10^{3}	6
79 00 5	1,1,2-Trichloroethane	5×10^{-3}	27	4.5×10^{3}	6
79 01 6	Trichloroethylene	5×10^{-3}	14	1.1×10^{3}	6
75 69 4	Trichlorofluoromethane	1×10^{1}	4	1.1×10^{3}	6
95 95 4	2,4,5-Trichlorophenol	4	4	1.19×10^{3}	6
88 06 2	2,4,6-Trichlorophenol	3×10^{-3}	5	8.0×10^{2}	6
93 76 5	2,4,5-Trichlorophenoxy-acetic acid (2,4,5-T)	4×10^{-1}	4	2.4×10^{2}(30°C)	2
96 18 4	1,2,3-Trichloropropane	2×10^{-1}	4	4×10^{3}	1
76 13 1	1,1,2-Trichloro-1,2,2-trifluoroethane	1×10^{3}	4	1×10^{1}	6
99 35 4	sym-Trinitrobenzene	2×10^{-3}	4	3.5×10^{2}	2
126 72 7	Tris(2,3-dibromopropyl) phosphate	3×10^{-5}	35	1.2×10^{2}	6
7440 62 2	Vanadium	2×10^{-1}	26		
75 01 4	Vinyl chloride	2×10^{-3}	14	2.67×10^{3}	6
1330 20 7	Xylene (mixed)	1×10^{1}	42	1.98×10^{2}	6
7440 66 6	Zinc	7	26		



NOTES:
1. DRAWING BASED ON JULY, 1992 SURVEY BY WESTSHORE ENGINEERING AND SURVEYING, INC.
2. SEDIMENT SAMPLES COLLECTED IN SEP/OCT 1993.

FIGURE 2

CONFIRMATORY SOIL SAMPLING LOCATIONS
MIDCO II SITE
GARY, INDIANA

ERM

MIDCO REMEDIAL CORPORATION

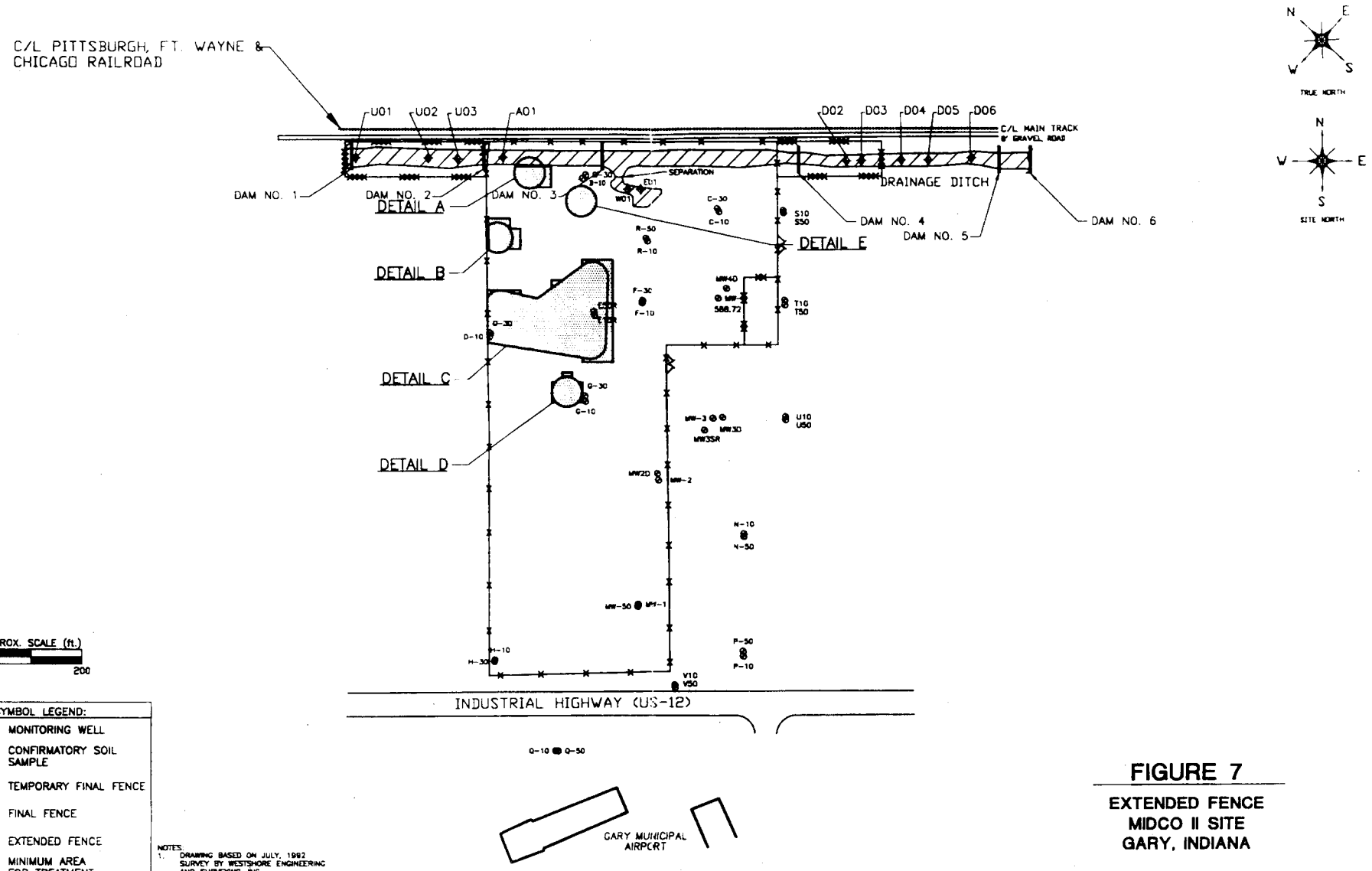


FIGURE 7

EXTENDED FENCE
MIDCO II SITE
GARY, INDIANA

TABLE 5-2
SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2)
MIDCO II SITE, GARY, INDIANA

Monitoring Well	Carcinogenic Risk (3)			Noncarcinogenic Risk (3)			Parameters at or Above MCL or AWQC				Background Concentration (4)
	Total	Contributing Parameters	Concentration (μg/l)	Total	Contributing Parameters	Concentration (μg/l)	Parameter	Concentration (μg/l)	MCL (μg/l)	AWQC (μg/l)	(μg/l)
MW-1	6E-04	(5)		2	1,2-Dichlorobenzene Cyanide	110 1,160	cis-1,2-Dichloroethene Trichloroethene Cyanide	170 350 J 1,160	70 5 200	 18.7	 158
MW-50	2E-03	(5)		6	Arsenic Barium	44.6 J 7,530	Barium Iron	7,530 43,500	2,000	 3,600	107 15,300
MW-2S	4E-06			0.05							
MW-2D	3E-03	(5)		5	Arsenic Barium	50 J 5,180	Arsenic Barium	50 J 5,180	50 2,000	173 	15.1 107
MW-3S	0E+00			0.2							
MW-3D	3E-03	(5)		4	Arsenic Barium	51.2 4,400	Arsenic Barium Iron	51.2 4,400 23,200	50 2,000	173 3,600	15.1 107 15,300
MW-4S	0E+00			0.2			Iron	19,600		3,600	15,300
MW-4D	4E-03	(5)		4	Arsenic Barium 4-Methyl-2-Pentanone	72.6 1,220 1,100 J	Arsenic	72.6	50	173	15.1
B-10	8E-05	(5)		0.4			Benzene	22 J	5		0.04
B-30	2E-03	Arsenic Chloroform	44.4 1 J	3	Arsenic Barium Acetone 2-Butanone	44.4 1,150 3,000 J 44 J					
C-10	2E-03	Arsenic Benzene	37.6 J 75	2	Arsenic Barium	37.6 J 336	Benzene Lead	75 55	5 	 53.6	0.04 5.6
C-30	3E-03	(5)		2	Arsenic Barium Nickel	57.2 J 420 94	Arsenic Chromium (III) (6)	57.2 J 156 J	50 100	173 2,010	15.1 7.5
D-10	2E-04	1,2-Dichloropropane Benzene	15 34	0.3			Benzene 1,2-Dicholoropropane	34 15	5 5	 	0.04
D-30	3E-03	Arsenic Benzene	64 4	2	Arsenic Barium Vanadium	64 345 40	Arsenic	64	50	173	15.1
E-10	0E+00			10	Cyanide 4-Methyl-2-Pentanone Toluene Ethyl Benzene Xylene	756 2,100 J 8,900 J 8,000 J 31,000 J	cis-1,2-Dichloroethene Toluene Ethyl Benzene Xylenes (Total) Cyanide	480 J 8,900 J 8,000 J 31,000 J 756	70 1,000 700 10,000 200	 18.7	 158
E-50	2E-03	(5)		2	Arsenic Barium	44.7 990					

TABLE 5-2
SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2)
MIDCO II SITE, GARY, INDIANA

Monitoring Well	Carcinogenic Risk (3)			Noncarcinogenic Risk (3)			Parameters at or Above MCL or AWQC				Background Concentration (4)
	Total	Contributing Parameters	Concentration (μg/l)	Total	Contributing Parameters	Concentration (μg/l)	Parameter	Concentration (μg/l)	MCL (μg/l)	AWQC (μg/l)	(μg/l)
F-10	0E+00			20	Toluene	33,000	Toluene	33,000	1,000		
					Ethyl Benzene	12,000	Ethyl Benzene	12,000	700		
					Xylenes	36,000	Xylenes (Total)	36,000	10,000		
					Manganese	738	Iron	32,100		3,600	15,300
F-30	2E-03	(5)		3	Arsenic	32.7					
					Barium	585					
					4-Methyl-2-Pentanone	2,000 J					
G-10	0E+00			2	Nickel	296	Ethyl Benzene	810	700		
					Ethyl Benzene	810	Styrene	100 J	100		
					Xylenes	3,800	Copper	245		120	25.2
G-30	2E-03	(5)		2	Arsenic	32 J	Chromium (III) (6)	595	100	2,010	7.5
					Barium	602					
					Nickel	131					
H-10	0E+00			0.0004							
H-30	1E-03	(5)		2	Arsenic	23.5	Barium	2,260	2000		107
					Barium	2,260					
N-10	0E+00			0.1							
N-50	3E-03	(5)		4	Arsenic	59	Arsenic	59	50	173	15.1
					Barium	2,780	Barium	2,780	2,000		107
							Iron	58,600		3,600	15,300
P-10	0E+00			0.2							
P-50	4E-03	(5)		2	Arsenic	70.4	Arsenic	70.4	50	173	15.1
					Barium	321	Iron	43,500		3,600	15,300
Q-10	0E+00			0.1							
Q-50	3E-03	(5)		4	Arsenic	51.3	Arsenic	51.3	50	173	15.1
					Barium	4,310	Barium	4,310	2,000		107
							Iron	37,000		3,600	15,300
R-10	0E+00			40	Barium	215	Toluene	100,000	1,000		
					Manganese	1,360	Ethyl Benzene	17,000	700		
					Nickel	1,030	Xylenes (Total)	49,000	10,000		
					Cyanide	377	Iron	25,000		3,600	15,300
					Toluene	100,000	Cyanide	377	200	18.7	158
					Ethyl Benzene	17,000					
					Xylenes	49,000					
R-50	8E-04	(5)		2	Arsenic	15.7					
					Barium	410					
					Nickel	54.1					
					4-Methyl-2-Pentanone	2,600 J					
S-10	1E-03	(5)		2	Arsenic	25.6					
					Selenium	15.9 J					
					Vanadium	160					

TABLE 5-2
SUMMARY OF THE COMPARISON OF ANALYTICAL RESULTS WITH THE CLEAN-UP ACTION LEVELS (1,2)
MIDCO II SITE, GARY, INDIANA

Monitoring Well	Carcinogenic Risk (3)			Noncarcinogenic Risk (3)			Parameters at or Above MCL or AWQC				Background Concentration (4)
	Total	Contributing Parameters	Concentration (μg/l)	Total	Contributing Parameters	Concentration (μg/l)	Parameter	Concentration (μg/l)	MCL (μg/l)	AWQC (μg/l)	(μg/l)
S-50	5E-03	(5)		6	Arsenic Barium Nickel	93.4 3,490 310	Arsenic Barium	93.4 3,490	50 2,000	173	15.1 107
T-10	4E-05	(5)		0.2			Benzene	11	5		0.04
T-50	3E-03	(5)		4	Arsenic Barium	50.7 4,510	Arsenic Barium Iron	50.7 4,510 48,000	50 2,000	173 3,600	15.1 107 15,300
U-10	0E+00			0.5			Iron	38,600		3,600	15,300
U-50	2E-03	(5)		2	Arsenic Barium	39.4 603	Iron	30,200		3,600	15,300
V-10	0E+00			0.1							
V-50	3E-03	(5)		7	Arsenic Barium	53.5 9,450	Arsenic Barium Iron	53.5 9,450 53,500	50 2,000	173 3,600	15.1 107 15,300

Key:
μg/l = Micrograms per liter
MCL = Maximum Contaminant Level. MCL's were obtained from 40 CFR Sec. 141
AWQC = Aquatic Water Quality Criteria. Obtained from Table 2 of Attachment 2 of the Statement of Work
J = The concentration is approximate due to limitations identified during the quality assurance review
CFR = Code of Federal Regulations

(1) All parameters detected below the background concentrations were not considered, as established in Attachment 2 of the Statement of Work.
(2) The complete validated data tables and risk calculation tables are included in Appendices E and F, respectively.
(3) Parameters are shown only if the cumulative risks for the location are above the acceptable carcinogenic risk of 1E-05 or above the acceptable noncarcinogenic risk of 1, and:
- Parameters produce individual carcinogenic risks above 1E-05, or they produce individual carcinogenic risks higher than 1E-06 and their sum produces a cumulative carcinogenic risk above 1E-05; or
- Parameters produce individual noncarcinogertic risks above 1, or (for parameters with the same effects) they produce individual noncarcinogenic risks above 0.1 and their sum produces a cumulative noncarcinogenic risk above 1.

(4) The background concentrations were obtained from Table 1 of Attachment 2 of the Midco I and II Statement of Work, dated June 1992.
(5) The carcinogenic or noncarcinogenic risk calculated for this location is above 1E-05 or 1, but it is produced by a single analyte for which an MCL has been promulgated (the list of parameters per sampling locations and risk type is included in Appendix B). In accordance to Attachment 2 of the Statement of Work, the analyte should not be included in the risk calculation, and its clean-up action level should be the corresponding MCL.
(6) The MCL is for total chromium and the AWQC is for trivalent chromium. The value detected was analyzed for total chromium; however, because no hexavalent chromium was found in the sample, this result corresponds to trivalent chromium.

TABLE 5-3
SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS
AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO II SITE
GARY, INDIANA

	1998 Annual Ground Water Monitoring			1997 Annual Ground Water Monitoring			1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
Parameter	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Volatile Organic Compounds														
Chloromethane				1/38	14 J	C-30	1/38	0.9 J	G-30					
Bromomethane				1/38	2 J	C-30								
Vinyl chloride				10/38	950 J	F-10	12/38	380 J	F-10	4/38	170	B-10	21	I-10
Chloroethane							1/38	0.8 J	C-10					
Methylene chloride				2/38	480	R-50	3/38	190	R-50R	2/38	17,000 J	R-10	26,000	E-10
Acetone	4/38	3,000 J	B-30	2/38	36,000 J	S-50	14/38	31,000	S-50	6/38	780 J	B-30	47,000	E-10
Carbon disulfide				2/38	0.1 J	G-10, Q-10	3/38	0.2 J	Q-50					
1,1-Dichloroethene							1/38	0.5 J	MW-1					
1,1-Dichloroethane	4/38	48 J	B-10	8/38	600 J	R-10	11/38	400 J	R-10	6/38	910	B-10	560	I-10
cis-1,2-Dichloroethene	5/38	480 J	E-10	10/38	2,800	F-10	11/38	1,800 J	F-10	9/38	1,100 J	F-10		
trans-1,2-Dichloroethene	1/38	44 J	B-10	2/38	220	B-10	4/38	2,400	E-10R	1/38	120 J	B-10	4,800	MW-1
Chloroform	2/38	1 J	B-30	1/38	1 J	C-30								
1,2-Dichloroethane				4/38	0.4 J	MW-4D, G-10, G-30	5/38	0.9 J	MW-2S					
2-Butanone	2/38	44 J	B-30	4/38	6,300 J	S-50	8/38	6,000	S-50	7/38	1,300 J	B-10	4,800 J	I-30
1,1,1-Trichloroethane				2/38	1,900 J	R-10	2/38	820 J	R-10	3/38	2,700 J	R-10		
Carbon tetrachloride				1/38	1 J	C-30								
Bromodichloromethane	1/38	0.2 J	MW-2S											
1,2-Dichloropropane	1/38	15	D-10	3/38	1,600 J	R-10	4/38	440 J	E-10R	4/38	1,900 J	R-10	100 J	B-10
Trichloroethene	2/38	350	MW-1	6/38	1,000 J	R-10	6/38	730 J	R-10	6/38	1,800 J	E-10	240,000	MW-1
1,1,2-Trichloroethane				1/38	0.8 J	G-10	1/38	0.2 J	G-10	2/38	300	B-10		
Benzene	5/38	75	C-10	10/38	650 J	R-10	10/38	120	E-10R	7/38	930 J	R-10		
4-Methyl-2-pentanone	9/38	2,600 J	R-50	10/38	12,000 J	R-10	12/38	3,700 J	F-10	12/38	38,000	R-10	460,000	E10
2-Hexanone							1/38	2 J	D-30	1/38	84 J	G-30		
Tetrachloroethene	1/38	0.2 J	MW-2S	1/38	6	G-10	2/38	3	G-10	2/38	130 J	B-10		
Toluene	9/38	100,000	R-10	4/38	96,000	R-10	12/38	56,000	R-10	7/38	120,000 J	R-10	84,000	E-10
Chlorobenzene	1/38	0.3 J	MW-2S	2/38	14 J	B-10	2/38	14 J	B-10					
Ethyl benzene	10/38	17,000	R-10	10/38	20,000	R-10	11/38	11,000	R-10	11/38	23,000	R-10	22,000	E-10
Styrene	2/38	100 J	G-10				1/38	2 J	D-10	1/38	5 J	D-10		
Xylenes (Total)	10/38	49,000	R-10	11/38	56,000	R-10	11/38	37,000	R-10	15/38	57,000	R-10	54,000	E-10
1,3-Dichlorobenzene				1/38	0.3 J	MW-4D	1/38	3 J	D-30					
1,4-Dichlorobenzene							1/38	0.1 J	V-50					
1,2-Dichlorobenzene	1/38	110	MW-1	1/38	18 J	MW-1								
1,2,4-Trichlorobenzene	1/38	0.40 J	MW-2S							1/38	10	D-10		

TABLE 5-3
SUMMARY OF THE TARGET COMPOUND LIST/TARGET ANALYTE LIST RESULTS
AND COMPARISON WITH PREVIOUSLY COLLECTED DATA (1)
MIDCO II SITE
GARY, INDIANA

	1998 Annual Ground Water Monitoring			1997 Annual Ground Water Monitoring			1996 Annual Ground Water Monitoring			1993 Predesign Investigation			1986-87 Remedial Investigation	
Parameter	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Frequency of Detection	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration	Highest Detected Concentration (ug/L)	Location of Highest Detected Concentration
Inorganics														
Aluminum	16/38	4,250	P-50	19/38	20,600	R-50	10/38	4,120	P-50	15/38	7,280	P-50	55,100	D-10
Antimony				4/38	32.4	MW-50	5/38	3.8 J	D-10	1/38	33.1	U-50		
Arsenic	27/38	93.4	S-50	33/38	91.3	MW-4D	35/38	104 J	S-50	15/38	76.2	D-30	178	D-30
Barium	38/38	9,450	V-50	38/38	10,300 J	V-50	38/38	12,400	V-50	37/38	8,210	Q-50	1,440	K-30
Beryllium				1/38	1.0	E-50	3/38	1.6	V-50					
Cadmium				4/38	4.3	G-30	11/38	11.0 J	Q-50					
Calcium	38/38	748,000	P-50	38/38	659,000	P-50	38/38	999,000 J	Q-50	38/38	1,250,000	Q-50	814,000	MW-3
Chromium	38/38	595	G-30	34/38	227 J	H-30	38/38	216	H-30	7/38	105	MW-4S	1,120 J	G-10
Cobalt	20/38	218	S-50	14/38	153	S-50	28/38	141	S-50	6/38	42.5	E-10	50	MW-2
Copper	22/38	245	G-10	13/38	607	G-10	27/38	847	G-10	3/38	727	G-10	6,060 J	G-10
Iron	37/38	58,600	N-50	38/38	59,600	N-50	38/38	92,700	Q-50	35/38	115,000	Q-50	82,200	MW-3
Lead	18/38	55.0	C-10	7/38	29.6	R-50	6/38	7.9	C-10	9/38	52.6 J	T-10	263 J	F-30
Magnesium	38/38	551,000	D-10	38/38	627,000 J	D-10	38/38	666,000	D-10	38/38	592,000	D-10	664,000	A-10
Manganese	38/38	2,740	U-10	38/38	1,960	U-10	38/38	4,370	V-10	36/38	1,840	V-10	8,330	MW-3
Mercury	1/38	0.11	S-10							6/38	0.69	P-50	2.81 J	MW-3
Nickel	34/38	1,030	R-10	29/38	1,060	R-10	38/38	546	R-10	26/38	725	R-10	16,600	B-30
Potassium	38/38	13,300,000 J	B-30	38/38	14,800,000	B-30	38/38	25,500,000	D-30	38/38	16,400,000	E-50	2,120,000	A-30
Selenium	8/38	16.0 J	S-10	4/38	36.8 J	S-10	3/38	6.0	H-10	5/38	31.3	S-10	212 J	G-30
Silver				1/38	1.2	E-10								
Sodium	38/38	13,700,000	MW-4D	38/38	13,000,000	B-30	38/38	13,000,000	B-30	37/38	14,900,000	E-50	15,500,000 J	L-30
Thallium				3/38	4.3	C-30	5/38	5.8	MW-2D	4/38	64.0 J	C-30	76 J	A-30
Vanadium	10/38	160	S-10	9/38	246	S-10	28/38	20.6	B-10	2/38	76.9	S-10	90	D-10
Zinc	18/38	294	G-10	17/38	424	G-10	14/38	375 J	G-10	26/38	338	G-10	2,100	C-30
Cyanide	15/38	1,160	MW-1	13/38	1,940 J	R-10	14/38	848 J	R-10	25/38	1,580	R-10	7,830 J	E-10
Chromium (VI)							4/38	120 J	C-10	18/38	90.0 J	B-10		

Key:
J= Estimated value

(1) Blank spaces denote that: the parameters were below their respective quantitation limits, the data were rejected, or the parameters were not analyzed (1986-87 Remedial Investigation only).